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PERCEPTION OF CLIMATE CHANGE AND ADAPTATION AMONG SMALL-HOLDER CASSAVA FARMERS IN ANAMBRA STATE, NIGERIA

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ABSTRACT
This study examined the perception of climate change and adaptation among small holder cassava farmers in Anambara. Three out of the four agricultural zones were purposively selected for the study based on intensity of agricultural activities. They are Anambra, Awka and Aguata zones. Multi-stage randomized sampling technique was adopted to select 120 cassava farmers in 2010 for the study, relevant data elicited from the farmers through structured questionnaire and analysed with descriptive statistics and 5 point likert scale measurement. Also multi-data gathering tools to obtain information such as focus group discussion (FGD) involving adult males, adult females and the youth, using scheduled discussion guide, in-depth interview of key informants/opinion leaders (such as the traditional ruler, president of the town union etc.) in the communities using structured checklist. The result indicated that farmers were mainly middle aged, educated and very experienced in farming and farming in the state is a female dominated occupation as about 62% of the farmers were females. The people are aware of climate change but the perception of climate change did not differ among gender in the study area. It was observed that women and children (including the youth) are more vulnerable to the impact of climate change than adult males. In order to respond positively to the negative impact of climate change farmers engaged in a paradigm shift of farming activities.

Keywords: Perception, Climate change, Adaptation and Cassava farmers

Introduction

Colocasia esculenta (Taro)and *Xanthosoma sagittitifolium* (Tannia) are the two food cocoyam crops of economic importance (Green and Oguzor, 2009). They belong to the Araceae family. Cocoyam is probably one of the oldest crops on earth and its domestication is likely to have occurred more than 10,000 years ago. Although some authors (Yen and Wheeler, 1968; Mathews, 1990) noted that cocoyam originated in Indo-Malayan region, between Maynmar and Bangladesh, there is insufficient evidence to confirm this supposition. Nigeria remains the largest producer of *Colocosia* in the world, with an estimated production of 5.49 million metric tons (FAO, 1990), followed by Ghana and China. It ranks third after cassava and yam, in terms of total production, land area under crop and importance. Taro (*C. esculenta*) is an important traditional staple crop in rural African countries, but its contribution to food security is limited by a lack of research on its agronomy and commercialization (Mare, 2009). It is a starchy widely cultivated crop and consumed in south eastern agricultural zone of Nigeria for decades (Ndon *et al*., 2003). Previously, cocoyam had been regarded as "poor man's food or woman's crop and such has lagged behind the preferred staple root/tuber crops such as yam and cassava in research attention (Ezeh and Mbanaso, 1987; Ikwelle *et al*., 2003).

Evidence has shown that changes in climate are already affecting crop yields in many countries (IPCC, 2007; BNRCC, 2008). This is particularly true in low-income countries, where climate is the primary determinant of agricultural productivity and adaptive capacities are low (SPORE, 2008; Apata *et a*l, 2009). This is evidenced by the fact that in some African counties some farmers have changed the times they plant their crops while others are changing to other agricultural enterprises that enable them to cope with effects of unpredictable and unfavourable climate changes in their region. This research intends to investigate the effects of climate change at the grassroots' also, the communities' perception and adaptation to changes in climate. This will helps to have a better understanding of the communities' perception of climate change and existing adaptation strategies.

Methodology

The study was carried out in Anambra State of Nigeria, three out of the four agricultural zones were

purposively selected these include; Anambra, Awka and Aguata zones. Multi-stage randomised sampling technique was adopted for the study with a total of 120 farm families in 2010 for the study. Relevant data elicited from the farmers through structured questionnaire were distributed to small-holder farmers. Data were also collected from both primary and secondary sources. Group interviews with male and female cassava farmers in selected locations using qualitative research tools (figs. 2 & 3); Interviews with farmer informants to provide more detail on specific issues; a. Focus group discussion (FGD) involving adult males, adult females (fig. 1), using scheduled discussion guide.

In-depth interview of key informants/opinion leaders (such as the traditional ruler, president of the town union etc) in the communities using structured checklist. Secondary data were collected through review of relevant documents. Data were analyzed by the use of descriptive statistics, lickert procedure and adaptation level of climate change using strongly agree (5), agree (4), undecided (3) disagree (2) and strongly disagree (1). Respondents with mean score of 3.0 and above imply they are in agreement that the attributes are important while respondents with mean score of less than 3.0 were not in agreement. To determine the mean likert level = Xs = ΣX. Xs of each item was computed by multiplying the frequency of each response pattern with its appropriate nominal value and dividing the sum with the number of respondent to the items. This can be summarized with equation below.

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$$Xs = \Sigma fn/N$$

Where Xs =mean score

Σ = summation

f= frequency

n = likert nominal value

N= number of the respondents

Xs=1+2+3+4+5/5 = 15/5 =3

Results and Discussion

The average statistics of the sampled farmers are presented in Table 1. On the average, a typical farmer in the state is 55 years old, with 8 years of education, 15 years of farming experience and an average household size of 12 persons. The average farmer cultivated 0.23ha of land and made an average of one extension contact in a year. About 10.67% and 23.56% of the respondents had access to credit and belong to one form of farmer organization or the other respectively. Farming in the state is a female dominated occupation with about 62% of the farmer's females.

Farmer perceptions of long-term temperature and precipitation changes

Table 2 shows that all the temperature and precipitation response variables had mean scores greater than 3 except decreased temperature (1.86). Increased temperature, altered climatic range and increased rainfall had mean scores of 4.01, 4.25 and 3.56 respectively. This implies that they were in agreement with respect to the response questions. Others were; decreased rainfall (4.52), changing timing of rains (4.38) and frequency of droughts (4.02) with mean scores also greater than 3 indicating they were also in agreement with the response questions. These responses show evidence of varying climatic changes in the study area.

The results in Table 3 show the perceived adaptation measures among farmers in the study area. The results show that increase in irrigation (4.17), shading (3.79), farming to non-farming (3.76), increased water conservation (3.49) and others (3.20) were the most important and significant perceived adaptations to climatic changes in the study area. The mean scores were greater than 3 indicating they are in agreement with the response questions.

The results in Table 4 show the rating scale analyses of adaptation measures adopted by the farmers in the study area. The results show that the most important adaptaion measure was mixed multiple crops/livestock under irrigation (4.26) which ranked highest. This was followed by making of bonds (3.57), cereal/legume intercropping (3.55), and multiple cropping under dry land which raked 2nd, 3rd, and 4th respectively.

Awareness and perception of climate change

From the FGD discussion, the farmers are aware of climate change but the perception of climate change did not differ among gender in the zone. They perceived climate change as delay in on-set of rains, scarcity of drinking water due to drying up of streams, and excessive heat. The impacts include late planting, poor crop yields, spending more time to fetch water.

Vulnerability to the impacts of identified hazards of climate change

It was observed that women and children (including the youth) are more vulnerable to the impact of climate change than adult males (FGD). For instance, whereas the women and children may have to endure thirst for water till they trek to a water source, the men can easily buy water to quench their thirst without waiting for the return of those who went to fetch water. Women depend on agriculture as a major source of income than those who have other off-farm (hunting, trading etc) sources of income.

Adaptation measures to impact of climate change hazards observed in the study area

The communities carry out manual work to create drainage channels, dig collection pits and contribute funds to construst culverts. The findings also showed that in the olden days, people offered sacrifices to the god of rain when there was drought. It was generally agreed that sacrificing to the god of rain yielded results.

However, the advent of christianity led to adandonment of this cosmovision approach to mitigate the challenge of late on- set of rain or draught as it is labelled fetish. The males (youth and adult men) are more involved in construction of drainage channels and pits than women. Men also contribute more money than women,

Conclusion

The results show that temperature is on the increase while the rains are decreasing leading to decreased yields in the study area. Farmers appear to be abandoning mono-cropping for mixed and mixed crop-livestock systems. Farmers in the area of study rely on rain fed agriculture, while considering risky, mono-cropping practicing under dry land. It is evidenced from this study that arable food crop farmers are experiencing change in climate and they have already devised a means to survive. These prevailing perceptions of farmers regarding the effects of climate change on root and tuber crops production have serious economic implications as evidenced in the increased expenditure on crop field maintenance; high economic waste when crops are washed away; low crop yield due to high pest /disease incidence as well as sharp reduction farm income resulting from low output of the crops. For the resource poor farmers to be further distressed by the effects of the climate change signals that danger is looming against both household and national food security. These negative effects of climate change can as well cripple all mechanism being employed by farm households to cope with the current global food crises. It is from this point that policy of reliable and effective measures of adaptation need to be implemented and must be accessible to the end users.

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Table 1: Average Statistics of Farmers sampled in Anambra State, Nigeria, 2011

S/No	Variable	Mean Value	Maximum Value	Minimum Value
1	Farm size (ha)	0.23	2.50	0.001
2	Membership of cooperatives %	23.56		
3	Access to Credit %	10.67		
4	Age (yrs)	55.00	70.00	22.00
5	Education (yrs)	8.00	15.00	0.00
6	Farming Experience (yrs)	15.00	43.00	2.00
7	Household size (No)	12.00	22.00	3.00
8	Extension Contacts (No)	1.25	5.00	0.00
9	Female farmers (%)	62.00		

Table 2: Lickert Scale Analysis of Perceptions to changing Climate

	Strongly agree	Agree	Undecided	Disagree	Strongly disagree	Total	Mean	Rank
Variables								
Increased temperature	73(365)	13(52)	05(15)	20(40)	9(9)	481	4.01	5
Decreased temperature	07(35)	06(24)	18(54)	14(28)	82(82)	223	1.86	7
Altered climatic range	68(340)	27(108)	15(45)	6(12)	4(4)	509	4.25	3
Increased rainfall	56(280)	32(128)	02(6)	17(34)	13(13)	427	3.56	6
Decreased rainfall	78(390)	36(144)	-	02(4)	04(4)	542	4.52	1
Changing timing of rains	83(415)	12(48)	15(45)	07(14)	03(3)	525	4.38	2
Frequency of droughts	53(265)	45(180)	03(9)	09(18)	10(10)	482	4.02	4

Table 3: Farmers Perceived Adaptations

	Strongly agree	Agree	Undecided	Disagree	Strongly disagree	Total	Mean	Rank
Variables								
Planting different crops	23(115)	12(48)	50(150)	5(10)	30(30)	353	2.95	8
Planting different varieties	9(45)	17(68)	39(117)	30(60)	25(25)	315	2.63	15
Crop diversification	3(15)	7(28)	62(186)	17(34)	26(26)	289	2.41	16
Different planting dates	11(55)	21(84)	19(57)	33(66)	84(84)	346	2.89	10
Shorten length of growing period	8(40)	12(48)	56(168)	42(84)	2(2)	342	2.85	12
Shifting cultivation	0	0	0	48(96)	72(72)	168	1.40	19
Changing hectarage	5(25)	26(104)	73(219)	6(12)	10(10)	370	3.09	6
Changing from Crop to livestock	0	2(10)	92(276)	19(38)	6(6)	330	2.75	13
Changing from livestock to crop	1(5)	3(12)	57(228)	43(86)	16(16)	347	2.90	9
Farming to non farming	36(180)	51(204)	3(9)	28(56)	2(2)	451	3.76	3
Non farming to farming	0	0	0	67(134)	53(53)	187	1.56	18
Increase in irrigation	63(315)	28(112)	9(27)	16(32)	14(14)	500	4.17	1
Use of chemicals	0	2(8)	52(156)	59(118)	7(7)	289	2.41	16
Increased water conservation	22(110)	45(180)	32(96)	11(22)	10(10)	418	3.49	4
Soil conservation	5(25)	17(68)	73(219)	20(40)	5(5)	357	2.98	7
Shading	31(155)	38(152)	45(135)	6(12)	0	454	3.79	2
Crop Insurance	0	0	98(294)	0	22(22)	316	2.64	14
Prayers	12(60)	17(68)	56(168)	15(30)	20(20)	346	2.89	10
others	21(105)	7(28)	72(216)	15(30)	5(5)	384	3.20	5

Source: Field survey, 2011(Figures in parentheses are response frequencies)

Table 4: Adaptation Measures

	Strongly agree	Agree	Undecided	Disagree	Strongly disagree	Total	Mean	Rank
Variables								
Multiple cropping under dry land	23(115)	8(32)	57(171)	15(30)	12(12)	360	3.00	4
Multiple cropping under irrigation	5(25)	13(52)	73(219)	9(18)	20(20)	334	2.79	6
Mixed mono-crop/livestock under dryland	12(60)	7(28)	35(105)	29(58)	25(25)	276	2.30	8
Mixed mono-crop/livestock under irrigation	3(15)	9(36)	62(186)	26(52)	20(20)	309	2.58	7
Mixed multiple crops/livestock under dryland	69((345)	30(120)	12(32)	5(10)	4(4)	511	4.26	1
Mixed multiple crops/livestock under irrigation	11(55)	17(68)	45(135)	27(54)	20(20)	332	2.77	5
Practiced zero tillage	2(10)	5(20)	18(54)	63(126)	32(32)	242	2.02	9
Making of bonds	36(180)	42(168)	7(21)	24(48)	11(11)	428	3.57	2
Cereal/Legume intercropping	29(145)	53(212)	9((27)	13(26)	16(16)	426	3.55	3

Fig.1: In-depth interview with key farmer informants

Fig. 2: Group of women farmers

Fig 3: Group of Male farmers in Group Discussion

Fig. 4: Impact of Decreased Rainfall